Name ________________ Class ____________ Date ____________

Modeling the Phases of the Cell Cycle

In a growing root, the cells at the tip of the root are constantly dividing. Because each cell divides independently of the others, a root tip contains many cells at different phases of the cell cycle. This makes a root tip an excellent tissue in which to study the cell cycle. In this investigation, you will identify and describe the phases of the cell cycle in root tip cells.

Problem

What do the phases of the cell cycle look like in a typical plant cell?

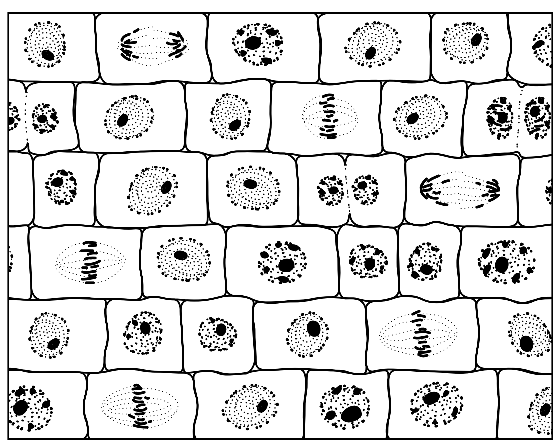
Materials

- microscope
- prepared slides of onion root tips
- scissors
- tape or glue
- craft materials such as beads, yarn, and pipe cleaners

Skills Classifying, Using Models

Procedure

1. Obtain a prepared slide of an onion root tip. Hold the slide up to the light and find the pointed end of the root section. This is the root tip where cells were actively dividing.
2. Place the slide on the microscope stage with the root tip pointing away from you. Using the low-power objective, adjust the focus of the microscope until the root tip is clearly visible. Just above the root tip is a region that contains many new small cells. The larger cells of this region were in the process of dividing when the slide was made. These are the cells you will be observing.
3. Observe the boxlike cells that are arranged in rows. Scan across one row and down to the next row to compare the cells. The chromosomes of the cells have been stained to make them easily visible. Select one cell whose chromosomes are easily visible. Switch to high power and sketch this cell on a separate sheet of paper.
4. Use the craft materials to make a model of the cell that you sketched, showing how its chromosomes are arranged.
5. Select at least four more cells whose internal appearances are different from the first cell you sketched. Switch to high power and sketch each of these cells on your cell sketch sheet. Repeat step 4 for each cell you sketch.



6. Choose 25 root tip cells at random and decide which phase of the cell cycle each is in. Record the number of cells in each phase in the data table below. If you find that some cells appear to be between two phases, record those observations as well.
7. Look closely at your sketches and models. Arrange the models in order to represent the process of cell division.
8. Refer to **Figure 10-5** on pages 246 and 247 of your textbook to determine whether you have ordered the phases of the cell cycle accurately. Correct the order of your models, if necessary. Label each of the models and sketches with the name of the phase it represents. Use the models to explain the process of cell division to another student.
9. Wash your hands with soap and warm water before you leave the lab.

Data Table

Phase	**Number of Cells**	**Observations**
Interphase		
Prophase		
Metaphase		
Anaphase		
Telophase		

Analyze and Conclude

1. **Analyzing Data** Do your results indicate that there were more cells in some phases than in others? Identify the most common phase(s) and explain what these differences in numbers of cells might mean.

2. **Drawing Conclusions** What evidence did you observe that shows mitosis is a continuous process, not a series of separate events?

3. **Using Models** Describe what is happening in each phase of your cell models.

4. **Using Models** Propose an alternative model to illustrate the same concept.

5. **Applying Concepts** Cells in the root divide many times as the root grows longer and thicker. With each cell division, the chromosomes are divided between two daughter cells, yet the number of chromosomes in each cell does not change. What process ensures that the normal number of chromosomes is restored after each cell division? During which part of the cell cycle does this process occur?